Other useful free tools and services 13

In this chapter we shall discuss some useful free tools and services. We shall have a quick introduction to data compression techniques. These techniques allow us to reduce the amount of memory and disk space required to store the information. We shall discuss the Archive Manager tool that lets us apply these techniques to files and entire directories. We shall briefly discuss VLC media player, a versatile multimedia tool. We shall also discuss the Google Maps service, which is an online service providing, maps of different areas. We will see two small but useful applications - Character Map, which allows us to insert various symbols and characters from different languages in our text. We shall then have an overview of the R environment for statistical computing. We shall learn some basic statistical operations like finding mean and median in R and also learn to draw bar graphs and histograms in R. Lastly we will look at two tools RationaPlan and Skype. While some of these applications come pre-installed with Ubuntu 10.04 LTS, others need to be installed from the Ubuntu repositories.

Data Compression

A modern computer system has lakhs of files on them. Often one needs to transfer a large number of these files or an entire directory structure to another computer or storage device. When we want to transfer computer files (containing data or programs or both) to another computer or storage device, the amount of data to be transferred or stored becomes a concern. Both computer networks and external storage devices are usually not as fast as internal components of a computer. Thus, transferring larger amount of data may take more time. If the Internet is used for such transfers, more time may be taken in the transfer due to slow Internet speed. Also, such transfers put load on the usually clogged Internet connection. Unless the user or organization has unlimited Internet plan, higher amount of data may result in higher cost as well.

Similarly, if the files and directories are transferred to a storage device, the amount of the data to be transferred again becomes an issue because of the finite capacity of storage devices and the multiple uses that they are put through. Considering these issues, there is a need to reduce the amount of storage space occupied by computer files (and entire directory structures), wherever possible. From a convenience point of view, in many cases it is also desirable to have a single file to handle rather than a large bunch of files or a complex directory structure.

Computer scientists have developed techniques to place a whole directory structure into a single file for convenience. Such a file is called an "archive". They have also developed a number of techniques for reducing the storage requirements of computer files and directory structures. These techniques are called data compression.

Data compression generally works by identifying repetition in the data and encoding the data in a way that reduces or eliminates such repetition. Some techniques also identify and eliminate less important information to conserve space. As an example, consider the children's rhyme shown in

figure 13.1. It certainly has a lot of repetition of words. We may take advantage of this and represent each word by a single digit or letter. At the beginning of our encoded file we shall have a table that tells us which digit/letter represents which word (this information is needed to convert the file back in its original uncompressed form). Afterwards, we may use a single digit/letter to represent a word. Thus, lengthy words appear only one time and subsequently they are represented by a single character. We leave punctuation as it is. We may mark the beginning of the table with a ^ (caret) symbol and end of the table with a $ symbol. The encoded file is also shown in the second half of figure 13.1.

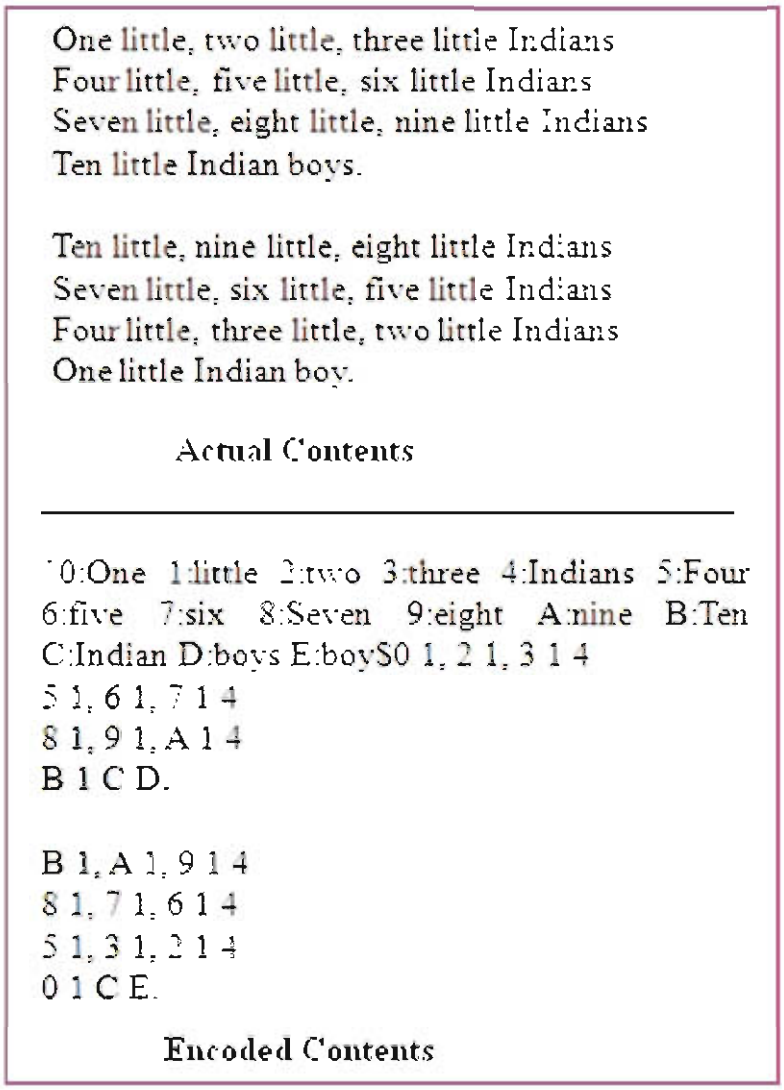

Figure 13.1 : Example of data compression

While the size of the original file was 324 bytes, the size of the encoded file is just 226 bytes. This is because each word is used in its full form only once; subsequently it is represented by a single character. The encoded file can be transformed into the original file at any time using the reverse process.

The scheme described here is fairly simple. Actual data compression programs use far more sophisticated algorithms based on information theory to achieve even greater reduction in size. Fortunately, Linux provides ready-made free and open source software for managing archive files. It is called Archive Manager.

Archive Manager

Archive Manager as shown in figure 13.2 permits us to combine many files or an entire directory tree into a single file known as an archive. On Linux systems, tar (tape archiver) is the most common archive format. It also provides the facility of compressing the archive to reduce its file size. It supports multiple compression algorithms and compressed file formats. The most common compressed file formats are the zip file format and the tar.gz file format. While the zip file format supports storing multiple files in a single zip file, on Unix/Linux systems the common practice is to combine the files into a single uncompressed file in the tar format and then compress the file in the zip format using gzip (GNU zip, an open source archiving program). Such a file commonly has the extension tar.gz and is called a "tar ball". The tar ball is a very common format for distributing software or bundles of files on the Linux platform. The zip format is also used by different applications under different names. For example, the JAR files in Java and the OpenOffice.org office suite file formats use zip compression. Archive Manager uses the extension part of the filename to identify the file format when opening an archive and to select the file format when creating a new archive.

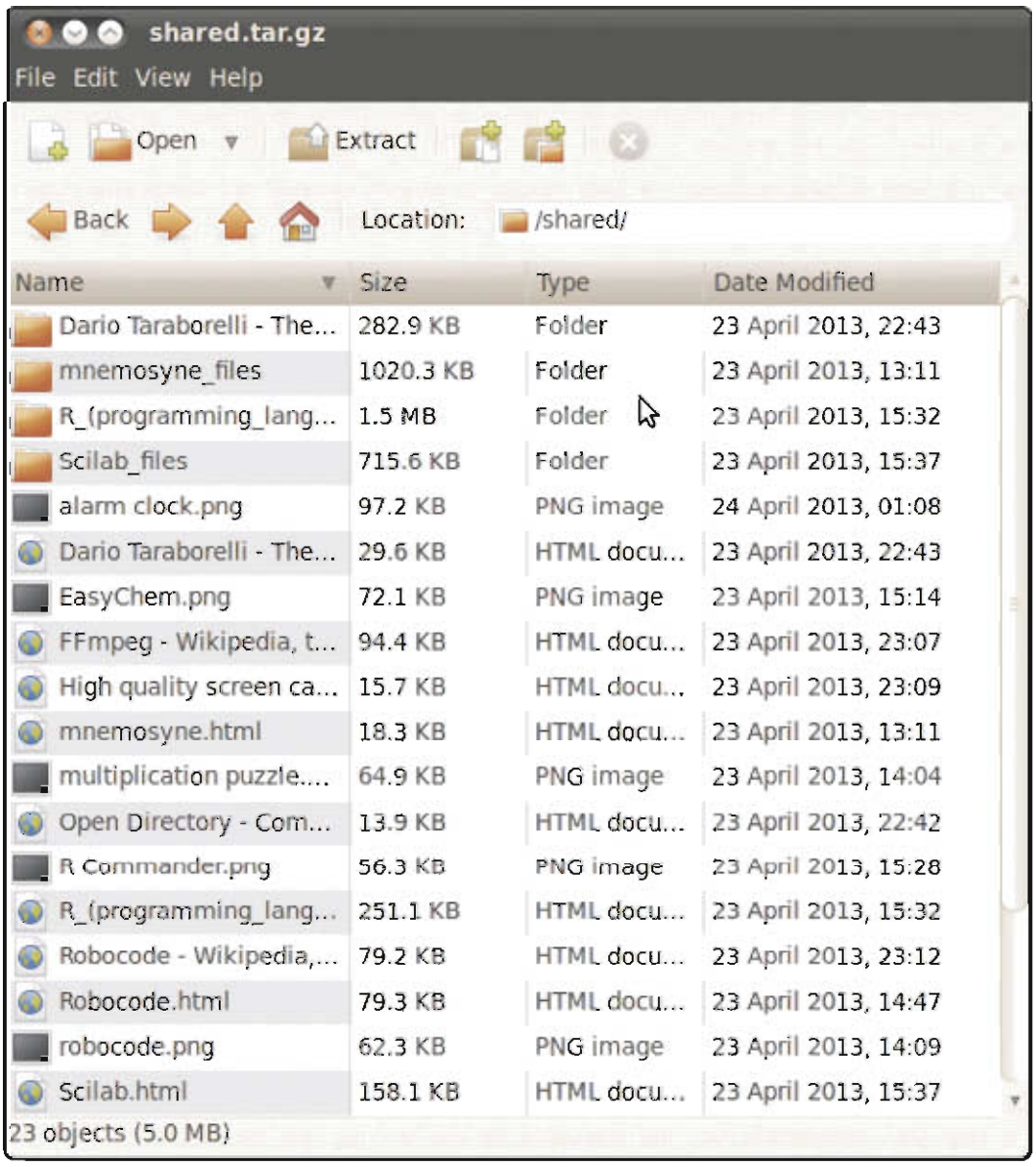

Figure 13.2 : Archive Manager

Archive Manager can also be used to explore the contents of archives, to extract files from the archives, to add new files to the archive, to delete files from the archive, and perform other such operations. There is no menu item to start the archive manager by default. One may double-click on an archive file in the Nautilus file browser to start the archive manager. A new archive can be created by right-clicking a file or directory and selecting the Compress... option from the context menu. This will create a new archive with that file or directory as its contents. This option is not available for files that are themselves archives. If we wish, we may add Archive Manager to the Accessories sub menu of the Application menu. For this, right-click the Ubuntu icon in the upper-left corner, select Edit Menu from the list, click on Accessories in the dialog box that opens and select the check box for Archive Manager and close the dialog box.

When an archive is open in the Archive Manager, the view is similar to a directory open in the Nautilus file browser as can be seen in figure 13.2. The operations and keyboard shortcuts are also similar. Double-clicking a directory opens that directory and shows its contents. The Up and Back buttons in the toolbar can be used to go to the parent directory (if it exists in the archive) and the previous directory (if any) respectively. They are enabled only when applicable.

Thus the Archive Manager helps us in creating and using archive files for backup, for transfer via an external storage device, for transfer via network, for saving disk space, etc.

The VLC Media Player

We have discussed earlier that Ubuntu comes with built-in tools to play multimedia content like audio, video, etc. However, another great open source tool called VLC (originally it was short form of VideoLAN Client) media player is shown in figure 13.3. It is also extremely popular because if its versatility and features.

Figure 13.3 : The VLC Media Player

Started as an academic project by the music-loving students of a university in Paris, it is now a community project available under multiple operating systems and has been downloaded over a billion times. One of the issues faced with multimedia content is that there are a variety of ways of converting multimedia information coming from hardware devices (audio/video streams) into computer data and then converting the computer data back into audio/video streams for playing on the hardware devices. This conversion (coding) and reverse conversion (decoding) is performed by a software component called codec (coder decoder). Each multimedia data format requires its own codec. The advantage of VLC is that it supports all the popular codecs and hence all the popular formats. It also supports all the major types of devices including web cameras, HD monitors, speakers of all types, microphones, headphones. VLC provides several options for playback of audio and video. It can convert multimedia files from one format to another. It can also stream (send) audio/video to and receive audio/video from another computer(s) over the network.

After starting VLC from the **Applications → Sound & Video** menu, we may open one or more files using the **Media → Open File...** menu item. We may open an entire directory using the **Media → Open Directory...** option. If we open a directory, VLC will actually open all media files in that directory playable by it. When one or more files are opened, they are added to the playlist. The playlist is a list of media files (tracks) to be played. We may play the media in the playlist in sequence, or in random order. We may go to the previous or next track. We may also save the playlist for playing the same tracks again. The playlist can be opened using the **View → Playlist** option and saved using the **Media → Save Playlist to File...** option. VLC supports multiple file formats for playlist, but M3U is more common.

At the bottom of the window, VLC displays a progress bar showing how much of the current track has been played and what is its total duration. By sliding the little slider on the bar, we may move back and forth in the current track. Below that, we have the play button (marked with a little right-pointing triangle). When the track is playing, this button turns into a pause button (with two parallel bars on it). If we pause the playback, the button reverts back to play mode. The middle button in the next three buttons is used to stop the playback completely, while the buttons with double arrows on the left and right allow us to jump to the previous and next track respectively. The next button acts as a toggle between watching a video in a window against watching it in full screen mode. That means, every time we click the button, it switches from one of these states to the other. In full screen mode, even the controls like play/pause, stop is hidden. They can be displayed in a temporary floating window by moving the mouse cursor over the video. The next button is for displaying the playlist. These options are available in the menu also.

While VLC has a lot of other functionalities as well, here we shall discuss how VLC can be used to convert multimedia files from one format to another. For this, select the **Media → Convert / Save** option from the menu. Using the Add button, select and add the file to be converted. Then from the list besides the Convert / Save button, select the Convert option. This will open another dialog box. Here, we need to provide the destination file (in which the converted track will be saved). We need to select appropriate file format (audio or video), from the drop down provided. Clicking on the Start button will now start the process and the progress will be shown. Sometimes, we may get error in the conversion process also.

Google Maps

Google Maps shown in figure 13.4 is a free Internet-based service provided by Google, Inc. Google has, over a period of years, collected extensive map data for the whole earth through various means like satellite imagery, cars with cameras mounted on them, data purchased from other organizations and data provided by millions of individual users around the world. Google Maps allows anybody to edit the maps and identify landmarks, buildings, etc. It also allows users to upload photographs of the place and post reviews of the place. The service is also heavily used on mobile devices like smartphones and tablets.

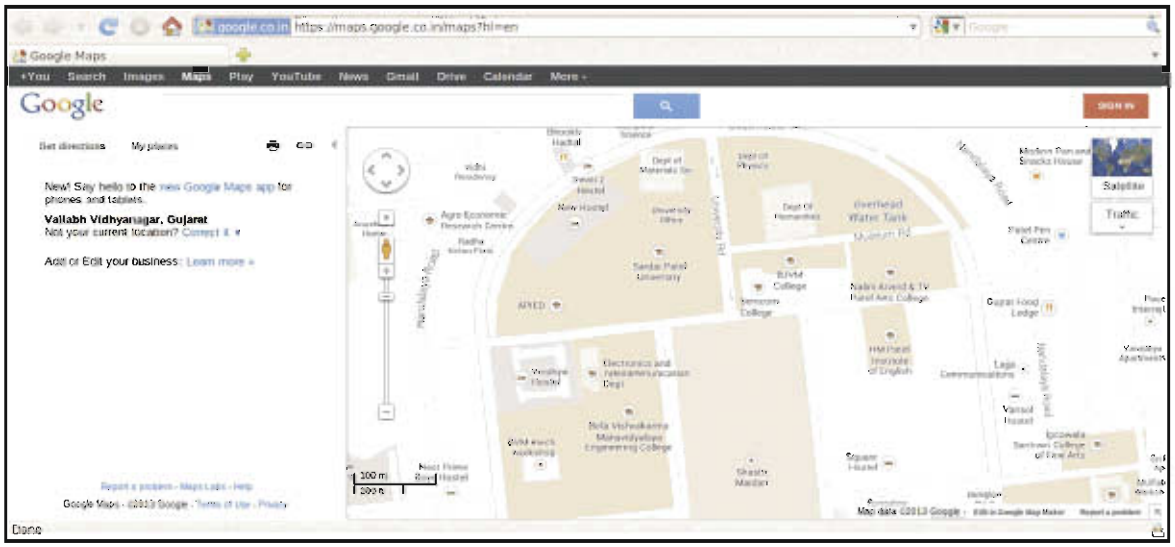

Figure 13.4 : The Google Maps Service

The service can be accessed from the web browser by opening the web site http://www.google.co.in and selecting the Maps option from the top menu, or directly entering the URL http://maps.google.co.in. On mobile phones, the service may be accessed from the mobile phone's web browser as well as from the Google Maps application. When accessed, the service first tries to know our current location. On the PC, a rough idea of the user's location can be obtained from the user's Internet connection. On a mobile phone, the user's location can be known with very high accuracy if the GPS (Global Positioning System) facility is used. This system finds a user's location with an estimated error of only few meters using satellite signals. Google maps also allows the user to correct the location, if it is inaccurate. Then it shows a map of the current location. We may pan (scroll) the map by dragging it in different directions or by clicking on the arrows in a circle on the left hand side. A vertical slider bar on the left allows us to zoom in and out on the map.

Google maps can show the information of a place in different forms. The default view is map view, shown in figure 13.4. By clicking on the Satellite button, we may switch to the satellite image view, shown in figure 13.5. In this view, the images taken by satellites in the sky are shown. The images are clear enough to identify most familiar buildings and roads. The service also provides the facility of getting directions on how to reach from place A to place B. The two places may be two different cities or places within the same city. The service also provides a choice of routes where available. Figure 13.6 shows an example. The service even provides turn-by-turn guidance while traveling if we use a mobile device equipped with GPS receiver. On a highway or in a crowded city area, walking or driving, the service decides the route based on the current location and destination and guides us with on-screen as well as voice (spoken) instructions.

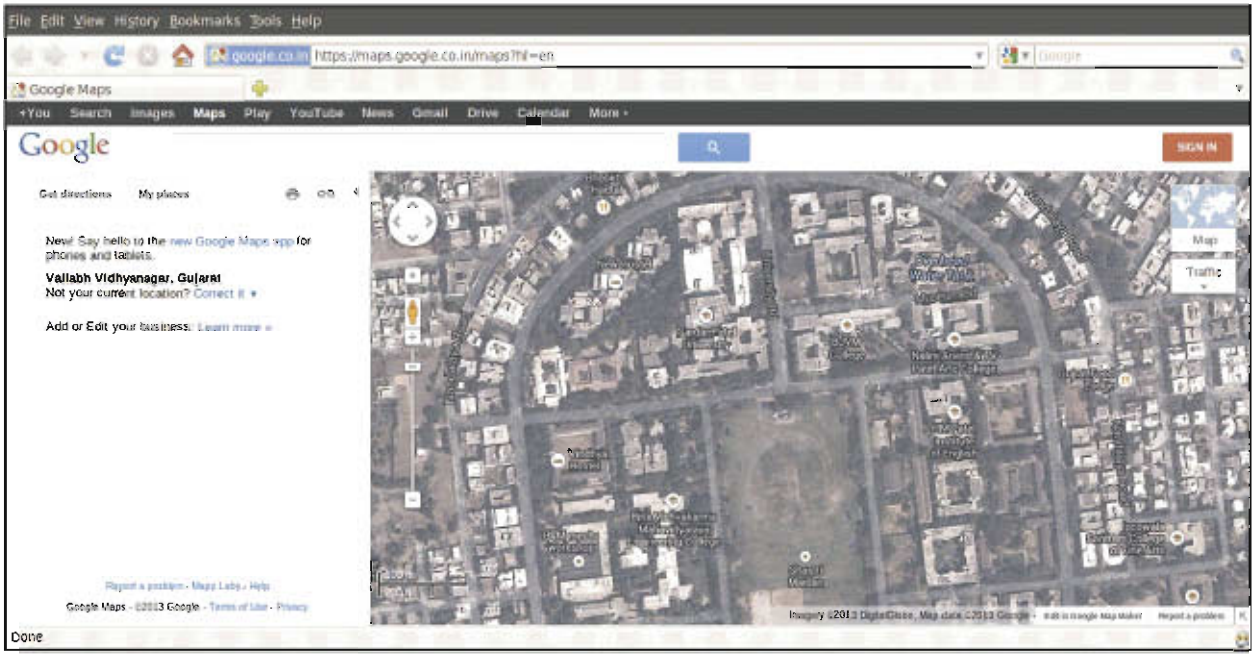

Figure 13.5 : The Google Maps Satellite Image View

There are several uses of the service. It can be used to search for a place and find its exact location. It can also be used to find directions to places unknown to us or in cities we are not familiar with. Government organizations and businesses use the service to provide people information on how to reach their offices. The service also has a facility using which anyone can display a map of any place on one's web site. Many organizations display such maps on their web sites. Tourist information web sites and Tourism departments of governments also make use of the service. It can also be used to display bus routes, current location of running trains, etc. The service also provides the facility of finding the nearest ATM centre, bank, restaurant, bus stop or any other such essential place.

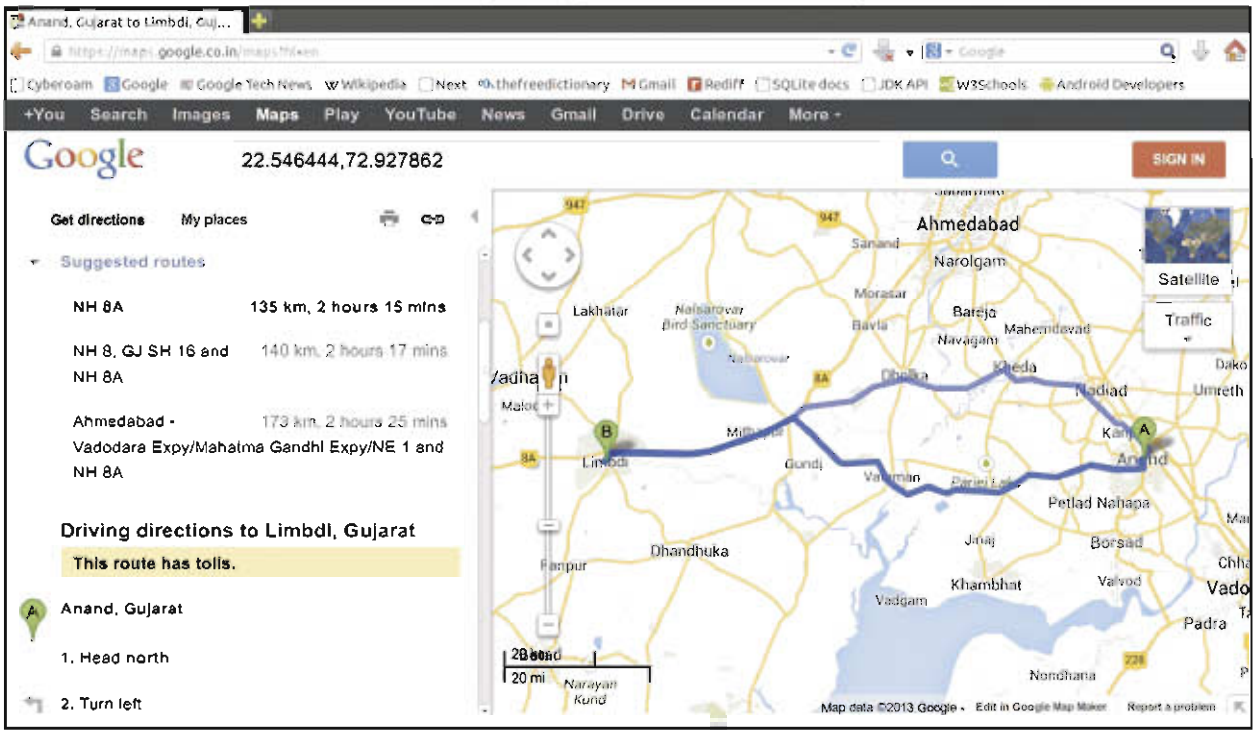

Figure 13.6 : Finding Directions using Google Maps

Character Map

The Character Map program shown in figure 13.7 can be used to enter Unicode characters into any application. We first select the script from the left pane and then double click characters to insert them into the Text to copy area below. Spaces and punctuation may be entered from the keyboard directly into the area after clicking in it. Combining characters, like the long "II" (??????) in Gujarati can also be entered and combine with the corresponding consonant appropriately. Brief details of the character currently selected with single-click or entered with double-click are shown in the status line at the bottom, while more details on the character is available in the Character Details tab. After we get a substantial amount of content, we may copy the content and paste into an application. If you only have to type a few characters in another script occasionally, then Character Map is a good solution for that.

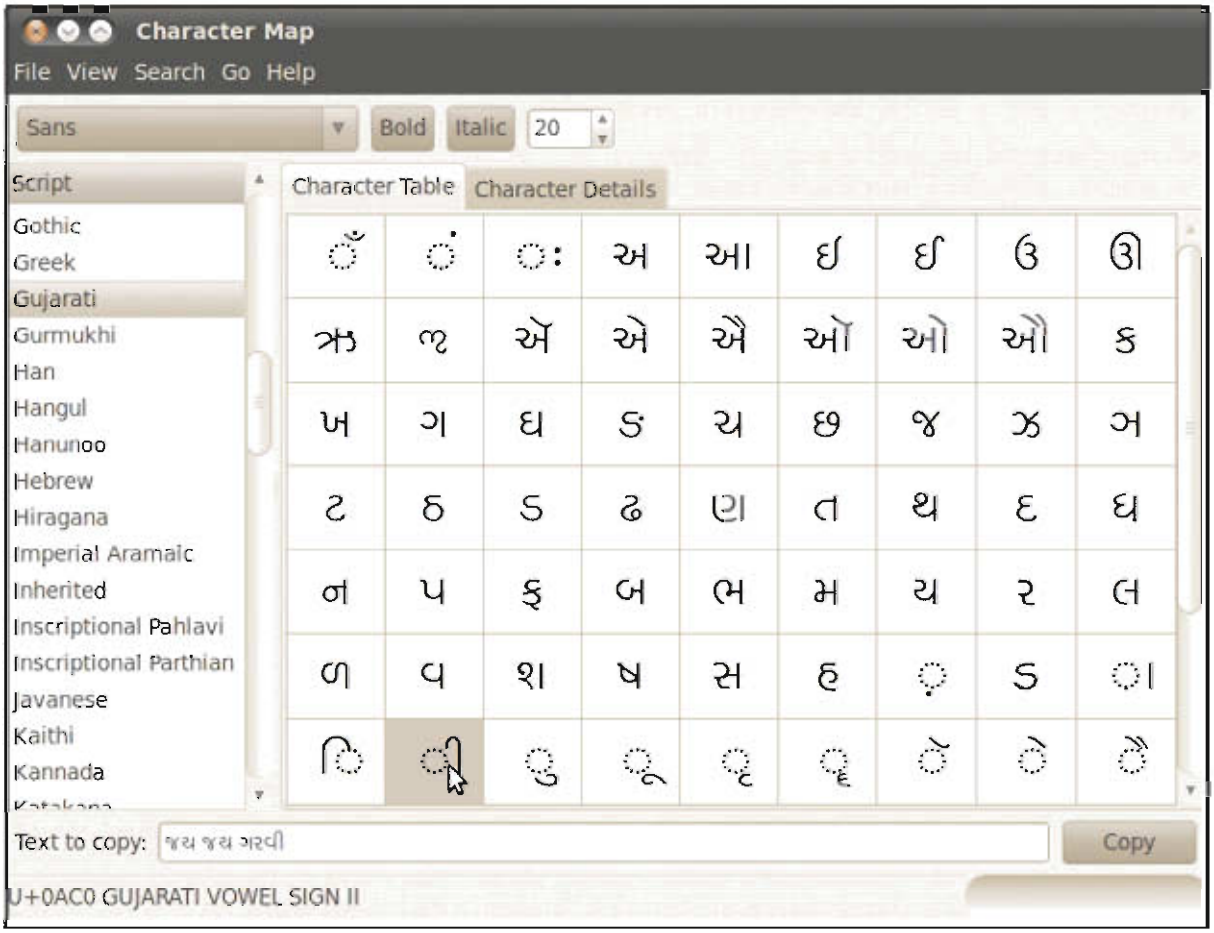

Figure 13.7 : The Character Map program

The R Software

R is a free software environment for statistical computing. It is a GNU project. It is widely used for statistical analysis. It has its own scripting language. It is a case-sensitive language. R has two work environments namely Command Line and Graphical. To use it in a GUI environment we need to install graphic editors like R Commander or RStudio from Ubuntu Software Center. The command to install R is given at the end of this chapter. To invoke the R scripts from terminal window, open terminal and type R on the command prompt. You will get a welcome message along with R prompt as shown in figure 13.8

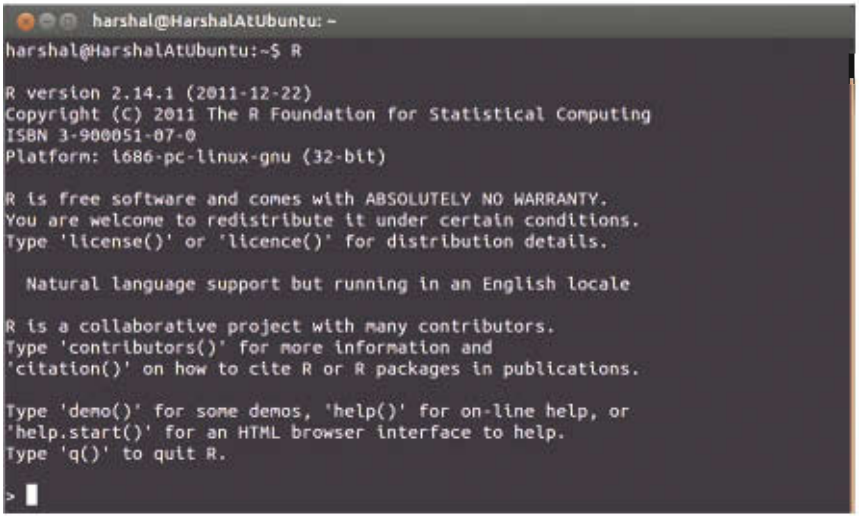

Figure 13.8 : R Command prompt

R uses # as the comment marker, just like the Linux shell. Any text following #, up to the end of the line, is treated as a comment. Number and string are the basic data types. Strings may be enclosed in single quotes or double quotes. Common operators and functions are available, just like other programming languages. Ordered lists of items (arrays or lists) are commonly used and are also referred to as vectors. Lists are created using the c function to combine several numbers into a single list. Most operators like +, -, *, /, and others work equally well on single number as well as on lists. However, when both operands of binary operators are lists, their lengths (number of elements in them) should ordinarily be same. Entering the name of a variable and pressing ENTER displays its value. An example of this concept is shown in figure 13.9.

Figure 13.9 : Working with variables in R

Here the symbol > shows the prompt of R. The statement > a ← 10 defines a variable 'a' and assigns it a value 10. The statement > a followed by Enter key press displays the value of a. Similarly the statement > b ← 20 defines a variable 'b' and assigns it a value 20. The statement > a*b followed by Enter key press multiplies the value of variable 'a' and 'b' and display the result on the prompt.

Some common R commands include q() for quitting R, help() for accessing the on line help, demo() for viewing some demonstrations and help.start() to open the on line help in a browser. To get help on a particular function we need to use the syntax help(function name). When we quit R, we are asked whether we want to save the data (values of variables) from the current session. If we respond "yes" or "y", the data will be saved in a file in the current directory and will be available in the next session of R we start from the same directory. The function ls() displays a list of all the variables we have defined as shown in figure 13.10.

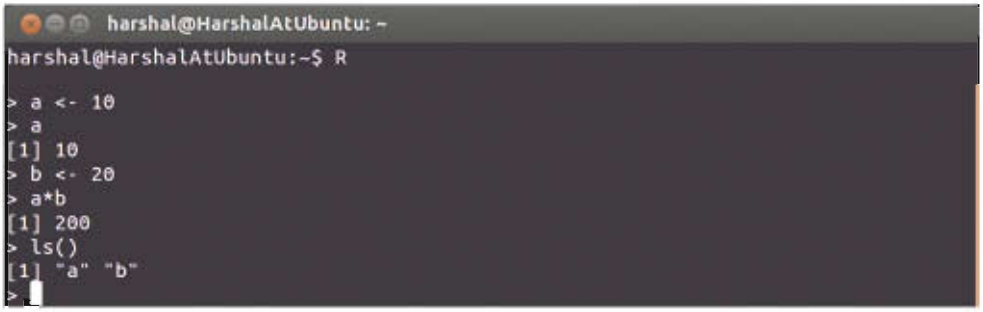

Figure 13.10 : Use of ls() in R

A series of consecutive numbers (range) may be generated using the syntax start:end. For example, 1:5 is same as c(1, 2, 3, 4, 5).

R also provides basic statistical operations quite straightforward forms. For example we may used the functions min(list), max(list), mean(list) and median(list) to find the minimum value, maximum value, mean and median for the list as shown in figure 13.11.

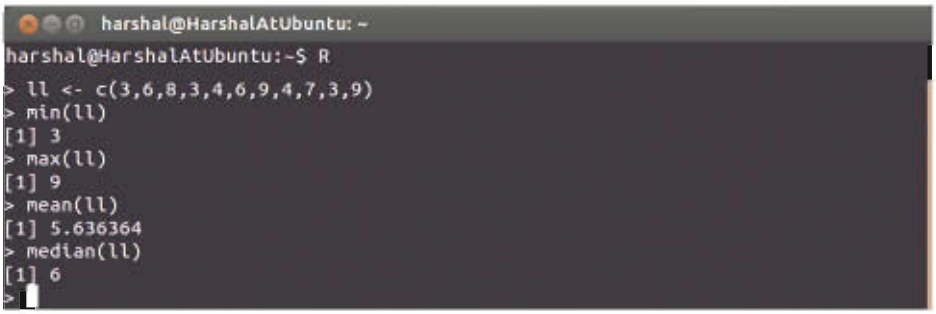

Figure 13.11 : Statistical functions in R

Plotting in R

Assume that we want to plot a bar chart that represents faculty wise students in a university. We may define the number of students as a list and the names of faculties as another list. Then we may use the function barplot with various arguments for drawing the plot as shown in figure 13.12.

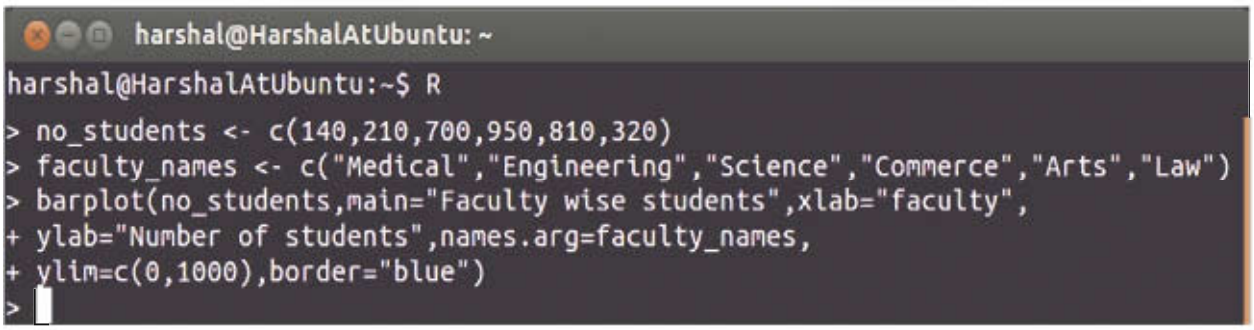

Figure 13.12 : Plotting graph in R

The first argument specifies the data list, while all other arguments have the form name=value. We use the arguments main, xlab, ylab, names.arg, ylim and border to specify the main title, X-axis label, Y-axis label, the values to be displayed for the bars, the range of values to be plotted on the Y-axis and border color respectively. Observe that for long commands, when we press ENTER before the command is complete, R issues the + prompt until we complete the command. By default the graph does not have grid lines as can be seen in figure 13.13.

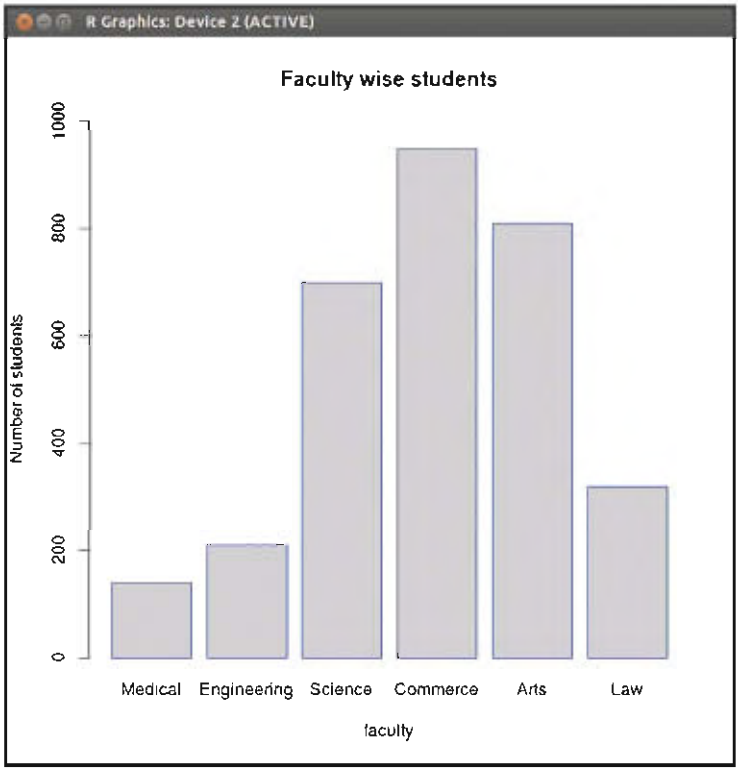

Figure 13.13 : A Bar Chart Produced in R

Producing histograms is also not difficult. Suppose we have marks out of 100 in a particular subject for several students. The histogram can be drawn using the code shown in figure 13.14 and will look like the plot shown in the same figure.

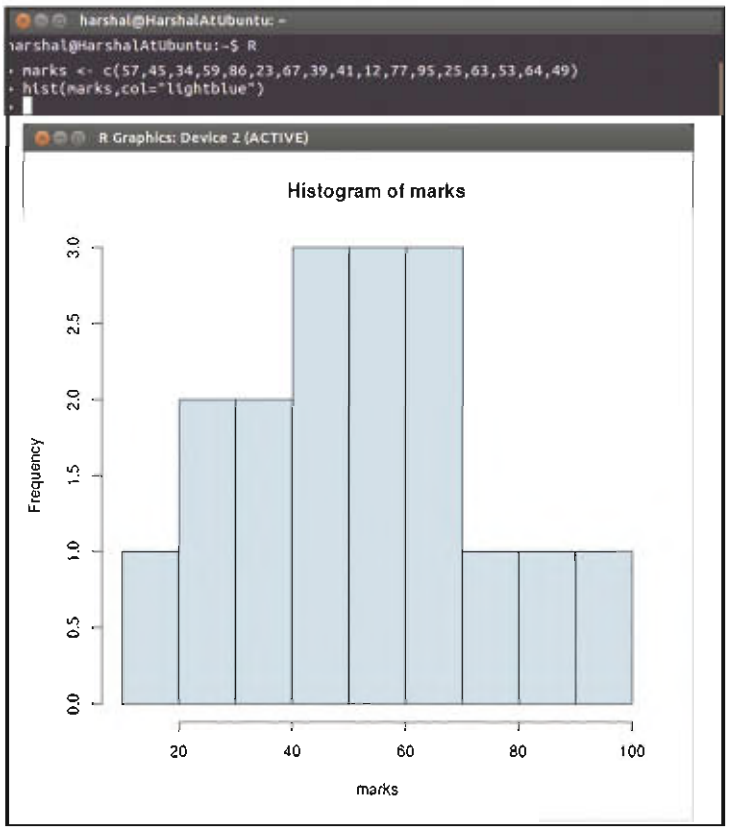

Figure 13.14 : A Histogram Produced in R

RationalPlan

People working in different areas like construction, engineering, services and consulting, business or software development usually work on a project that is having constraints of time, resource and budget. Any delay in completion of the project increases the cost of the project. At some point of time to manage this kind of project we need to prepare, maintain and follow a well defined plan. Such a plan helps us to complete the project as scheduled, on time and within budget.

RationalPlan is one such open source software designed to assist project managers in preparing, maintaining and following a well defined project plan. It assists the project managers throughout the life cycle of their projects. It comprises three different desktop products namely RationalPlan Single, Multi and Viewer.

RationalPlan Single allows us to manage independent projects that do not have common resources and has no interrelations between different projects. It allows the manager to associate general project information like name, notes, links, assumptions, constraints or risks. It allows creating, editing and deleting calendars, building schedules. Once the resources are created we can assign tasks to them. It provides project tracking tools such as critical path, mark completion value for tasks, work and cost time phased information. We can generate a printable report as well as import data from other project management tool or export our data into other formats.

RationalPlan Multi allows us to manage projects that share company resources across projects. It also manages interdependencies between projects. It includes all the features of RationalPlan Single Project. Further it calculates the resources data (work, cost, over allocation) considering their assignments in all projects. It allows links between tasks pertaining to different projects, analyzes all our projects data and creates a project Portfolio view.

RationalPlan Viewer is an additional tool developed to share the project in its original file format (.xrp), but it can be used as well to open Microsoft Project files. It is useful to anybody who needs to check and overview the project's evolution without making changes to the schedule, and for resources to see their assignments.

Though as of today the support of RationPlan on Unbuntu 10.04 has been removed it is available for Ubuntu 12.04 and later versions.

Skype

You must have used various instant messaging services like Yahoo Messenger, Google Talk or Rediff Bol. We use them for real time chatting with text, audio and video facilities. Skype is one such software that allows us to make calls over the Internet using our computer.

The Skype service allows users to communicate with peers using voice, video as well as text. We can use Skype to place phone call to recipients on the traditional telephone network also. The calls to landline telephones or mobile phones are charged via a debit based user account system while calls to other users within the Skype service are free of charge. It also provides additional features like file transfer and videoconferencing.

The Skype software can be downloaded free of cost, though its source code is proprietary and not available for modification. To use Skype we need a working sound input and output configuration. Most

modern computers today support both these features. In laptops they are inbuilt while on desktop we may use extensions like a headset, speaker and a web cam. We can install Skype from Software Center.

To start Skype, choose **Applications → Internet → Skype.** If you are opening it for the first time it will open an End User License Agreement window. Read the contents and click on "I agree" button. We will now see a window as shown in figure 13.15.

Figure 13.15 : Skype initial window

To use the Skype service you will need a Skype user account. In case you don't have one, then click on the link with contents "Don't have a Skype Name yet?", follow procedure to create a Skype name. Once you have a Skype name and password you can enter the details in the textbox of the window shown in figure 13.15 and click on the "Sign in" button. If everything goes well you can now start interacting with other Skype users or make phone calls using Skype.

Summary

In this chapter we discussed some useful free tools and services. We learnt about data compression techniques that allow us to reduce the amount of memory and disk space required to store the information. We discussed the Archive Manager tool that lets us apply these techniques to files and entire directories. We also introduced VLC media player, a feature-rich multimedia tool. We discussed the Google Maps service, which is an online service providing, maps of different areas. We learnt how to use Character Map to insert various symbols and characters from different languages in our text. We had an overview of the R environment for statistical computing. We learnt some basic statistical operations like calculating mean and median in R and learnt to draw bar graphs and histograms in R. Finally we saw the use of RationalPlan and Skype.

Instruction for Teachers

The tools covered in this chapter are only for demonstration purpose. The teachers are requested to show demo of these tools to the students. The examples given in laboratory exercise section can be used by teachers for demonstration. Teacher needs to install R software on the machines. To install R use the command given below :

sudo apt-get install r-base r-base-dev

EXERCISE

1. Write a short note on data compression.
2. Why do we need data compression tools ?
3. List main features of Archive Manager.
4. Write the main features of the VLC media player.
5. List the applications of Google Maps.
6. Explain the use of the Character Map program.
7. Choose the most appropriate option from those given below :

(1) Which of the following refers to a file that has an entire directory structure inside it ?

(a) apache (b) archie (c) archi (d) archive

(2) What is the full form of tar ?

(a) tape archiver (b) tech archiver (c) test archiver (d) tight archiver

(3) For which types of archives is the password protection option available ?

(a) zip (b) tar (c) tar.gz (d) both zip and tar.gz

(4) Which of the following is a feature-rich media player ?

(a) VAC (b) VEC (c) VLC (d) VNC

(5) What is the full form of VLC ?

(a) VideoLAN Client (b) Video Line Coder

(c) Video Length Coder (d) Video List Creater

(6) Which technology gives our location with accuracy ?

(a) GRS (b) GPRS (c) GRPS (d) GPS

(7) Which program is used to enter Unicode characters into any application ?

(a) Character Display (b) Character Insert

(c) Character Map (d) Character Select

(8) Which command is used to quit from R ?

(a) quit() (b) q() (c) exit() (d) close()

(9) Which function is used to create a bar graph in R ?

(a) bar() (b) plot() (c) bargraph() (d) barplot()

(10) Which of the following are different variants of RationalPlan ?

(a) Single, Multi, Viewer (b) Singular, Multiple

(c) View, Preview (d) Server, Client

LABORATORY EXERCISE

1. Create a zip file and store an entire directory in it.
2. Create a tar.gz file and store an entire directory in it.
3. Extract all files from the zip archive above into a subdirectory files1.
4. Extract all files from the tar.gz archive above into a subdirectory files2.
5. Locate your school on Google Maps. Can you identify the building in the satellite image?
6. Locate your home in Google Maps. Obtain directions for reaching your school from your home. Is it the same path you take?
7. Type सत्यमेवजयते in gedit using Character Map.
8. Type $\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$ in gedit with help from Character Map.
9. Plot a bar graph of the number of days in each month of the (non-leap) year.
10. Plot a bar graph of the number of pages in your textbooks.
11. Plot a histogram of the frequency of letters in the names of days of the week (sunday, monday, …saturday). Only include the letters that occur at least once.
12. Create your own Skype user account and try to explore the facilities provided by Skype service.